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Reengineering the obsolete semiconductor

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Have you looked for a hermetically packaged μ A741 or DS1691 lately, or anything resembling those parts? Good luck locating them. They are nowhere to be found. As is natural in the evolution of technology, original device manufacturers have abandoned them – along with many other parts – and moved to newer technologies and different product classes. While the new parts are adequate in many applications, in high-reliability applications they can fail in equipment that's exposed to high heat, vacuum or other environmental stress.

This leaves engineers with the choice of redesigning their system to use different parts, or reengineering the obsolete semiconductor. Neither is a great option. Typically, a system maker would not reengineer a device, since to undertake such a project can be technically daunting at a minimum, or catastrophic in the most extreme cases.

Fortunately, solutions are at hand from companies maintaining inventories of wafers that can be packaged and tested to meet the need for high-reliability parts. And in some cases where the wafers no longer exist, obsolete parts can be redesigned to original specifications, and fabricated.

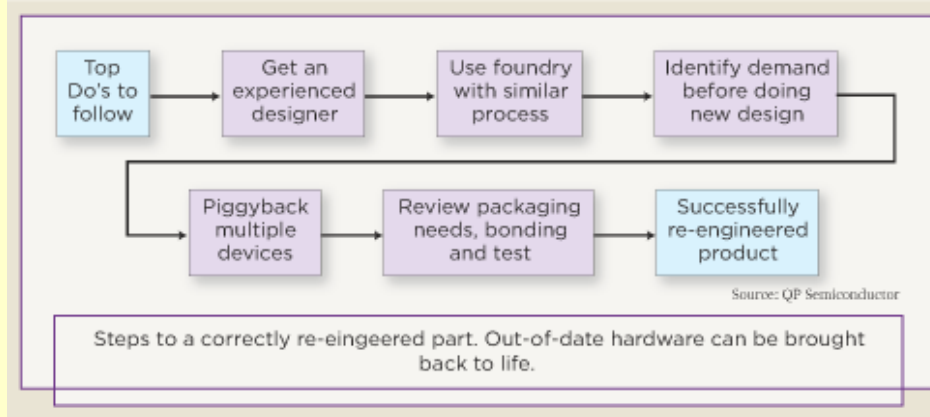
The question is, what are the key considerations when looking for a partner to produce obsolete parts for your mission-critical application? These basic due-diligence Do's and Don'ts can help you to make the right moves.

Do

- **Seek designers familiar with the target process/technology.** The designer makes all the difference between success and failure. Look for one with a track record in the base technology. Review some reference designs that would point to skill and experience. Investigate previous design engagements – was the designer on time, did the design function and meet specifications? How many re-spins did it take to get the final part? Were there any fundamental design or foundry problems?
- **Use a foundry with a process as similar to the original as possible.** Good design and a well-profiled process impact the ultimate performance of the reengineered device. Temperature performance, speed and power drain are all affected by the process. Match the original parameters as closely as possible to ensure that the reengineered device comes close to matching performance of the old one.
- **Identify demand before undertaking a new design.** Before committing significant resources, make sure there's real demand for the device. Talk to potential customers. Ask whether this would be a short-term solution or fill a longer-term need. Find out how many potential customers exist. Look for a product "family" vs. a single part.
- **Piggyback multiple devices.** When customers need a single part, it's likely they have similar needs for "sister" parts. Is there a way to capture the family in a design suite? One core design may serve several device variations, which dramatically reduces costs by spreading them over several devices.
- **Review package needs, bonding and test.** For many obsolete parts, packages may also be obsolete. Make sure there are plenty of piece parts before designing. Also make sure you know how to bond the new devices. The bonding diagram, package and die all must match.

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Don't

- **Make multiple "inventions" in one design.** Start with a designer who is familiar with a process and technology at a particular fab, so that the only variable is the design itself. Once a part works, then you can increase the number of design permutations.
- **Assume old test programs/hardware will work.** Although the part is being made to mimic an old device, redesigning will produce a new device. Ensure enough time in the schedule to design and debug new test programs and hardware. Among other things, the new part will probably be faster, so you may need to decouple the test fixture differently and/or change the test program setup-and-hold cycles. Be prepared to debug the test setup as well as the device.
- **Ignore built-in testing.** In fact, you should plan to debug the part by incorporating built-in test features to simplify the process. Add internal probe pads where you can isolate circuit elements, but make sure not to increase capacitance. For example, if you're building a high-speed PROM with a registered output array, you could isolate the register for testing/debug.
- **Leave out an empowered project manager.** Start all projects with dedicated, empowered project managers who have ownership from start to finish. Programs managed by a team can move slowly, lose direction and sometimes fail. Always assign a project manager to drive the project through to completion, on time and on budget.
- **Start vast projects with half-vast preparation.** Recognize that the design and manufacture of a semiconductor is a highly complex process. Use a project-management program to track and identify tasks on the "critical path" and to pinpoint potential resource shortages before they occur.



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About QP Semiconductor

Founded in 1985 as a test services company, QP Semiconductor ranks today as the world's largest fabless supplier of high-reliability hermetic ICs for military, aerospace and industrial systems. From its headquarters in Santa Clara, California, QP Semiconductor provides design, re-engineering and a full range of manufacturing capabilities to extend the life of classic ICs for a host of mission-critical programs. www.QPSEMI.com